What Is Claimed:

1. A method for detecting a protein of interest comprising:
contacting a coenzyme with a synthetic appendage label,
contacting a carrier protein domain with the protein of interest to form a carrier protein (CP) domain –protein of interest (POI) complex,
contacting the carrier protein (CP) domain –protein of interest (POI) complex with the labeled coenzyme to form a labeled coenzyme –carrier protein (CP) domain –protein of interest (POI) complex, and
detecting the labeled carrier protein domain to detect the protein of interest.

2. The method of claim 1 wherein the CP domain is a biosynthetic enzyme carrier protein domain.

3. The method of claim 2 wherein the protein of interest is a biosynthetic enzyme.

4. The method of claim 2 wherein the carrier protein domain is a polyketide (PK) synthase carrier protein domain, a non-ribosomal peptide (NRP) synthase carrier protein domain, or a fatty acid (FA) synthase carrier protein domain.

5. The method of claim 4 wherein the polyketide (PK) synthase carrier protein domain comprises at least one domain with acyl carrier protein (ACP) activity.

6. The method of claim 4 wherein the non-ribosomal peptide (NRP) synthase carrier protein domain comprises at least one domain with peptidyl carrier protein (PCP), aryl carrier protein (ArCP) and/or acyl carrier protein (ACP) activity.

7. The method of claim 4 wherein the fatty acid (FA) synthase carrier protein domain comprises at least one domain with acyl carrier protein (ACP) activity.

8. The method of claim 3 wherein the biosynthetic enzyme is a hybrid between a FA synthase, PK synthase, and/or NRP synthase and further comprises at least one domain with acyl carrier protein (ACP) and/or aryl carrier protein (ArCP) activity.

9. The method of claim 3, further comprising digesting the biosynthetic enzyme with a protease.

10. The method of claim 9, wherein the synthetic appendage label further comprises a linker and a reporter.

11. The method of claim 9, further comprising contacting the labeled coenzyme –carrier protein (CP) domain –protein of interest (POI) complex with a radioactively-labeled coenzyme to form a radioactively labeled coenzyme –carrier protein (CP) domain –protein of interest (POI) complex.

12. The method of claim 1, further comprising contacting the labeled coenzyme –carrier protein (CP) domain –protein of interest (POI) complex with a radioactively-labeled coenzyme to form a radioactively labeled coenzyme –carrier protein (CP) domain –protein of interest (POI) complex.

13. The method of claim 1, wherein said contacting the carrier protein (CP) domain with the protein of interest (POI) further comprises synthesizing a CP domain -POI fusion protein to form a carrier protein (CP) domain –protein of interest (POI) complex.

14. The method of claim 13, wherein the carrier protein (CP) domain further comprises an amino acid consensus sequence, [DEQGSTALMKRH]-[LIVMFYSTAC]-[GNQ]-[LIVMFYAG]-[DNEKHS]-S-[LIVMST]-{PCFY}-[STAGCPQLIVMF]-[LIVMATN]-[DENQGTAKRHLM]-[LIVMWSTA]-[LIVGSTACR]- (x2)-[LIVMFA].

15. The method of claim 1 wherein the labeled coenzyme –CP domain –POI complex further comprises coenzyme A (CoA) or a derivative thereof.

16. The method of claim 1 further comprising contacting the CP domain –POI complex and the labeled coenzyme with a phosphotransferase enzyme to form a labeled coenzyme –CP domain –POI complex.

17. The method of claim 16 wherein the phosphotransferase enzyme is a 4'-phosphopantetheinyl transferase.

18. The method of claim 10 wherein the reporter is an affinity reporter, a colored reporter, a fluorescent reporter, a magnetic reporter, a radioisotopic reporter, a peptide reporter, a

metal reporter, a nucleic acid reporter, a lipid reporter, a glycosylation reporter, or a reactive reporter.

19. The method of claim 18, wherein the synthetic appendage label further comprises a protein chip immobilization label, a two-hybrid or three-hybrid analysis label, or a trace purification label.

20. The method of claim 10, wherein the reporter is a precursor to an affinity reporter, a colored reporter, a fluorescent reporter, a magnetic reporter, a radioisotopic reporter, a peptide reporter, a metal reporter, a nucleic acid reporter, a lipid reporter, a glycosylation reporter, or a reactive reporter.

21. The method of claim 1 further comprising detecting or modulating a function of label by interaction with a secondary molecule.

22. The method of claim 21 wherein the secondary molecule is a carbohydrate, a protein, a peptide, an oligonucleotide, or a synthetic receptor.

23. The method of claim 3, further comprising assembling libraries of biosynthetic enzymes, coenzymes and synthetic appendage labels,
contacting individual units of biosynthetic enzymes, coenzymes and synthetic appendage labels from libraries of POIs, coenzymes and synthetic appendage labels, and
detecting transfer of synthetic appendage label from coenzyme to carrier protein of the biosynthetic enzyme, wherein specificity of the transfer detects the biosynthetic enzyme.

24. The method of claim 23 wherein the individual units from libraries of coenzymes are spatially-addressed on a three dimensional object.

25. The method of claim 23 wherein the individual units from libraries of enzymes are spatially-addressed on a three dimensional object.

26. The method of claim 23 wherein the individual units from libraries of labels are spatially-addressed on a three dimensional object.

27. The method of claim 23 wherein the individual units from libraries of coenzymes and libraries of enzymes are spatially-addressed on a three dimensional object.

28. The method of claim 23 wherein the individual units from libraries of coenzymes and labels are spatially-addressed on a three dimensional object.

29. The method of claim 23 wherein the individual units from libraries of coenzymes, labels and enzymes are spatially-addressed on a three dimensional object.

30. The method of claim 1 or claim 23 further comprising identifying the biosynthetic enzyme within a cell culture.

31. The method of claim 1 or claim 23 further comprising identifying the biosynthetic enzyme by molecular weight.

32. The method of claim 31 wherein the enzyme molecular weight is determined by a technique selected from gel electrophoresis, affinity chromatography or mass spectrometry.

33. The method of claim 1 or claim 23 further comprising identifying the protein of interest by nucleic acid or protein sequencing.

34. The method of claim 1 or claim 23 further comprising isolating the protein of interest.

35. The method of claim 1 further comprising assaying for the expression and/or activity of the protein of interest.

36. The method of claim 1 or claim 23 further comprising screening for proteins of interest.

37. The method of claim 35 further comprising quantifying the expression a given protein of interest or group of proteins of interest.

38. The method of claim 23, further comprising quantifying temporal events related to the expression a given protein of interest.

39. The method of claim 1 further comprising identifying a cell, cell-line, organism or class of organisms characterized by the marking of the protein of interest with the label.

40. The method of claim 39 further comprising determining a time of infection or a stage in a cell cycle or a stage in a life cycle.

41. The method of claim 39 further comprising determining a level of virulence of the organism.

42. The method of claim 3 or claim 23 further comprising identifying novel natural products from the biosynthetic enzyme.

43. The method of claim 3 or claim 23 further comprising screening for inhibitors of the biosynthetic pathways.

44. The method of claim 3 or 23 further comprising measuring individual responses of the biosynthetic enzyme to given conditions to identify the biosynthetic enzyme using a profiler.

45. The method of claim 1, further comprising removing chemically or enzymatically the product generated from the transfer of the synthetic appendage label.

46. The method of claim 45 further comprising removing the synthetic appendage label from the carrier protein domain by light.

47. The method of claim 45 further comprising removing the synthetic appendage label from the carrier protein domain by heat.

48. The method of claim 45 further comprising removing the synthetic appendage label from the carrier protein domain by a chemical reagent.

49. The method of claim 45 further comprising removing the synthetic appendage label from the carrier protein domain by an enzyme.

50. The method of claim 49 wherein the enzyme is an acyl carrier protein phosphodiesterase.

51. A microarray for identification of a protein of interest (POI) comprising:
a coenzyme linked to a synthetic appendage label,
a carrier protein domain contacting the labeled coenzyme and the POI to form a carrier protein- POI -coenzyme complex,
the synthetic appendage label transferred from the coenzyme to the carrier protein domain within the microarray, wherein the labeled carrier protein domain detects the POI.

52. The microarray of claim 51 further comprising individual units of enzymes derived from libraries of enzymes, coenzymes derived from libraries of coenzymes and synthetic appendage labels derived from libraries of synthetic appendage labels, wherein the individual units of enzymes, coenzymes and synthetic appendage labels are spatially addressed on a three dimensional object.

53. The microarray of claim 51 wherein the POI is a biosynthetic enzyme.

54. The microarray of claim 53 wherein the biosynthetic enzyme is selected from a polyketide (PK) synthase, a non-ribosomal peptide (NRP) synthase, or a fatty acid (FA) synthase.

55. The microarray of claim 54 wherein the polyketide (PK) synthase comprises at least one domain with acyl carrier protein (ACP) activity.

56. The microarray of claim 54 wherein the non-ribosomal peptide (NRP) synthase comprises at least one domain with peptidyl carrier protein (PCP), aryl carrier protein (ArCP) and/or acyl carrier protein (ACP) activity.

57. The microarray of claim 54 wherein the fatty acid (FA) synthase comprises at least one domain with acyl carrier protein (ACP) and/or aryl carrier protein (ArCP) activity.

58. The microarray of claim 51 wherein the biosynthetic enzyme comprises a hybrid between a FA synthase, PK synthase, and/or NRP synthase and further comprises at least one domain with acyl carrier protein (ACP) and/or aryl carrier protein (ArCP) activity.

59. The microarray of claim 51 wherein the carrier protein-enzyme-coenzyme complex further comprises coenzyme A (CoA) or a derivative thereof.

60. The microarray of claim 51 wherein the carrier protein-POI-coenzyme complex further comprises a phosphotransferase enzyme.

61. The microarray of claim 51 wherein the phosphotransferase enzyme is a 4'-phosphopantetheinyl transferase.

62. The microarray of claim 51 ,wherein the synthetic appendage label further comprises a linker and a reporter

63. The microarray of claim 62 wherein the reporter is an affinity reporter, a colored reporter, a fluorescent reporter, a magnetic reporter, a radioisotopic reporter, a peptide label, a metal reporter, a nucleic acid reporter, a lipid reporter, a glycosylation reporter, or a reactive reporter.

64. The microarray of claim 62 wherein the reporter is a precursor to an affinity reporter, a colored reporter, a fluorescent reporter, a magnetic reporter, a radioisotopic reporter, a peptide reporter, a metal reporter, a nucleic acid reporter, a lipid reporter, a glycosylation reporter, or a reactive reporter.

65. The microarray of claim 51 further comprising interaction with a secondary molecule to detect or modulate a function of the label.

66. The microarray of claim 65 wherein the secondary molecule is selected from a carbohydrate, a protein, a peptide, an oligonucleotide, or a synthetic receptor.

67. The microarray of claim 51, further comprising a profiler to measure individual responses of the biosynthetic enzyme to given conditions to identify the biosynthetic enzyme.

68. The microarray of claim 51, further comprising a product generated from the transfer of the synthetic appendage label to the carrier protein is removed chemically or enzymatically.